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PATENT APPLICATION

ATTORNEY DOCKET NO. 200300734-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): David Champion et al.

Application No.: 10/767,732

Filing Date: 01/28/2004

Confirmation No.: 6089

Examiner: Natalie K. Walford

Group Art Unit: 2879

Title: PHOTONIC CRYSTAL FILAMENT AND METHODS

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on 02/02/2007.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $520.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120	☐ 2nd Month $460	☐ 3rd Month $1050	☐ 4th Month $1640

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 520. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

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Signature: T. R. Touw

Respectfully submitted,
David Champion et al.
By T. R. Touw

Theodore R. Touw
Attorney/Agent for Applicant(s)
Reg No. : 36,702
Date : 03/01/2007
Telephone : (541) 967-9133

Rev 10/06 (ApBrief)

Attorney Docket No. 200300734-1; Ser. No. 10/767,732

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants: David Champion et al.	Date: March 1, 2007
Serial No. 10/767,732 Confirmation No. 6089 Filed 01/28/2004	Group Art Unit: 2879
Title: PHOTONIC-CRYSTAL FILAMENT AND METHODS	Examiner: Walford, Natalie K.

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
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PO Box 1450
Alexandria, VA 22313-1450

Sir:

1. Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, LP, a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H. 249, Houston, TX 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware corporation, headquartered in Palo Alto, California. The general or managing partner of HPDC is HPQ Holdings, LLC.

2. Related Appeals and Interferences

There are no related appeals or interferences that will directly affect, be directly affected by, or have a bearing on the present appeal, that are known to Appellants or Appellants' patent representative.

3. Status of Claims

Claims 1 – 66 were originally pending in the application. In a first substantive Office Action mailed on June 6, 2006, claims 2, 11 – 25, 37 – 39, 41 – 43, and 51 – 66 were withdrawn from consideration based on an earlier restriction requirement dated February 6, 2006 and on a subsequent election response by Appellants on March 6, 2006, which response included amendment of claims 27, 37 – 39, 45 – 50, 52 – 59, 61, 65, and 66 to correct improper dependencies. In response to the first substantive Office Action mailed on June 6, 2006, Appellants amended claims 1 and 44. This is an appeal from the Final Office Action mailed on November 3, 2006 finally rejecting claims 1, 3 – 10, 26 – 36, 40, and 44 – 50. The present appeal is directed to claims 1, 3 – 10, 26 – 36, 40, and 44 – 50, i.e., all of the presently pending claims that stand rejected in this application.

4. Status of Amendments

No amendments were filed after the Final Office Action.

5. Summary of Claimed Subject Matter

Claim 1 is directed to a method for forming a photonic-crystal filament (10), the method comprising steps of:

a) mixing a slurry (15) comprising particles (11) of substantially uniform size and a precursor material for a desired metal (step S10);

b) urging the slurry (15) through an orifice (35) while forcing the particles and precursor material into a combination having a desired crystallographic configuration (step S40);

c) drying the combination (45) having a desired crystallographic configuration emerging from the orifice (35) (step S50); and

d) sintering the precursor material (step S70), whereby a photonic-crystal filament (10) is formed.

Claim 44 is directed to a method of cladding a metal filament, the method comprising the steps of:

a) providing a metal filament (110);

b) mixing a slurry (15) comprising particles (11) of substantially uniform size and a precursor material for a desired metal;

c) urging the metal filament (110) and the slurry (15) through an orifice (35) while forcing the particles and precursor material into a combination (45) having a desired crystal configuration surrounding the metal filament;

d) drying the combination (45) having the desired crystallographic configuration emerging from the orifice;

e) sintering the precursor material; and

f) compressing the precursor material within a sheath (100), while drawing the filament (110) and sheath (100) through a series of two or more successively smaller dies (115), whereby the filament (110) is clad with a photonic crystal (10).

6. Grounds of Rejection to be Reviewed on Appeal

The issues on appeal are whether the Examiner erred in rejecting claims 1, 4 – 5, 31, 36, and 40 under 35 U.S.C. § 102(e) as anticipated by Enokido et al. (published U.S. patent application 2004/0255841); whether the Examiner erred in rejecting claims 3, 8, 29 – 30, 32, 44 – 48, and 50 under 35 USC § 103(a) as being unpatentable over Enokido et al.; whether the Examiner erred in rejecting claims 6 – 7, 26 – 28, 33 – 35, and 49 under 35 USC § 103(a) as being unpatentable over Enokido et al. in view of Fleming et al. (US 6,768,256); and whether the Examiner erred in rejecting claims 9 and 10 under 35 USC § 103(a) as being unpatentable over Enokido et al. in view of Kodas et al. (US 2003/0175411).

7. Argument

I. Legal Standards

A. Law of Anticipation

Claims 1, 4 – 5, 31, 36, and 40 have been rejected under 35 U.S.C. § 102 (e), which states:

> A person shall be entitled to a patent unless –
>
> ...
>
> (e) the invention was described in — (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent ...

Under Section 102, a claim is anticipated, i.e., rendered not novel, when a prior art reference discloses every limitation of the claim. In re Schreiber, 128 F.3rd 1473, 1477 (Fed. Cir.1997). Although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." In re Mills, 916 F.2d 680, 682 (Fed. Cir. 1990). "Rejections under 35 U.S.C. § 102(a) are proper only when the claimed subject matter is identically disclosed or described in the prior art." In re Arkley, Eardley, and Long, 172 U.S.P.Q. 524, 526 (CCPA 1972).

Claim terms will be given their ordinary and accustomed meaning, unless there is "an express intent to impart a novel meaning to [the] claim [term]" by the patentee. York Prods., Inc. v. Cent. Tractor Farm & Family Ctr., 99 F.3d 1568, 1572 (Fed. Cir. 1996); Sage Prods. v. Devon Indus., Inc., 126 F.3d 1420, 1423 (Fed. Cir. 1997). The ordinary and accustomed meaning of a claim term is determined by reference to dictionaries, encyclopedias, and treatises available at the time of the patent. See Texas Digital Systems, Inc., 308 F.3d at 1203. Such references are always available for claim construction purposes and are neither extrinsic nor intrinsic evidence. See Texas Digital Systems, Inc. v. Telegenix, Inc., 308 F.3d 1193, 1202-03 (Fed. Cir. 2002).

In order to impart a specific meaning to a claim term, i.e., for the inventor to be [his] own lexicographer, such lexicography must appear "with reasonable clarity, deliberateness, and precision." In re Paulsen, 30 F.3d 1475, 1480 (Fed. Cir. 1994). However, intrinsic evidence may be consulted to determine the definite meaning of a claim term that is unclear. CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1367 (Fed. Cir. 2002). A claim term may be redefined without any express statement of redefinition in the specification. Bell Atl. Network Servs., Inc. v. Covad Communications Group, Inc., 262 F.3d 1258, 1268 (Fed. Cir. 2001). "[A] claim term will not carry its ordinary meaning if the intrinsic evidence shows that the patentee distinguished that term from prior art on the basis of a particular embodiment" or "described a particular embodiment as important to the invention."

B. Law of Obviousness

Claims 3, 6 – 10, 26 – 30, 32 – 35, and 44 – 50 stand rejected under 35 U.S.C. § 103(a), which states:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The legal standards under 35 U.S.C. § 103(a) are well-settled. Obviousness under 35 U.S.C. § 103(a) involves four factual inquires: 1) the scope and content of the prior art; 2) the differences between the claims and the prior art; 3) the level of ordinary skill in the pertinent art; and 4) secondary considerations, if any, of nonobviousness. See Graham v. John Deere Co., 383 U.S. 1, 148 U.S.P.Q. 459 (1966).

In proceedings before the Patent and Trademark Office, the Examiner bears the burden of establishing a prima facie case of obviousness based upon the prior art. In re Piasecki, 745 F.2d 1468, 1471-72, 223 U.S.P.Q. 785, 787-88

(Fed. Cir. 1984). "[The Examiner] can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." In re Fritch, 972 F.2d 1260, 1265, 23 U.S.P.Q. 2d 1780, 1783 (Fed. Cir. 1992).

As noted by the Federal Circuit, the "factual inquiry whether to combine references must be thorough and searching." McGinley v. Franklin Sports, Inc., 262 F.3d 1339, 60 U.S.P.Q. 2d 1001 (Fed. Cir. 2001). Further, it "must be based on objective evidence of record." In re Lee, 277 F.3d 1338, 61 U.S.P.Q. 2d 1430 (Fed. Cir. 2002). The teaching or suggestion to make the claimed combination must be found in the prior art, and not in the applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q. 2d 1438 (Fed. Cir. 1991). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 U.S.P.Q. 2d 1430 (Fed. Cir. 1990). "It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to '[use] that which the inventor taught against its teacher.'" Lee (citing W.L. Gore v. Garlock, Inc., 721 F.2d 1540, 1553, 220 U.S.P.Q. 303, 312-13 (Fed. Cir. 1983)). Teaching away from the claimed invention is a strong indication of non-obviousness and an improper combination of references. U.S. v. Adams, 383 U.S. 39 (1966). As stated by the Federal Circuit in In re Ochiai , 71 F.3d 1565, 1572, 37 USPQ2d 1127, 1133 (Fed. Cir. 1995), "reliance on *per se* rules of obviousness is legally incorrect ..."

II. The Examiner's Rejection of Claims 1, 4 – 5, 31, 36, and 40 under 35 U.S.C. § 102(e) as Being Anticipated by Enokido et al. (U.S. patent application 2004/0255841) Should Be Reversed Because Enokido et al. Does Not Disclose Every Limitation of Each of the Claims.

The claimed invention is not anticipated under § 102 unless each and every element of the claimed invention is found in the prior art. (Hydratech, Inc.

v. Monochronal Antibodies, Inc., Fed. Cir. 1986). Accordingly, the rejection of these claims under 35 U.S.C. § 102(b) is improper and should be reversed.

A. Claim 1

Independent Claim 1 is directed to a method including (emphasis added):

"b) urging the slurry through an orifice *while forcing the particles and precursor material into a combination having a desired crystallographic configuration;*" and

"c) drying the combination *having a desired crystallographic configuration* emerging from the orifice".

Neither Enokido et al. nor the material incorporated by reference from Sachs et al. discloses these limitations of claim 1. In the method of Enokido et al., their slurry is jetted in a layer onto a substrate and a *binder* is jetted in a predetermined three-dimensional periodic structure pattern (Enokido et al., paragraphs 13, 17, 27, 41, 43 – 45 , and 54 – 58 and FIGS. 1, 2A – 25 , and 3, for example). The *particles* within their slurry are not forced into a combination having a desired crystallographic configuration as recited in Appellants' claim 1.

B. Claim 4

Claim 4 recites: "The method of claim 1, further comprising the step of:

f) heating the dried combination to remove the particles."

Regarding claim 4 specifically, the Examiner has stated that "Enokido discloses the method of claim 1, further comprising the step of f) heating the dried combination to remove the particles (paragraphs 41 – 49)." However, in the cited paragraphs of Enokido et al. solvents are removed by drying (optionally with heat), binder is dried (optionally with heat), and binder is cured by heat treatment, but no particles are removed by heating. In paragraph 49 of Enokido et al., dielectric powder existing in the non-bound region is removed by dipping in water. Thus, contrary to the Examiner's assertion, Enokido et al. does not teach removal of particles by heating as recited in Appellants' claim 4.

C. Claim 5

Claim 5 recites: "The method of claim 4, wherein the heating step f) and the sintering step d) are performed simultaneously." The Examiner has stated that "Enokido discloses the method of claim 4 wherein the heating step f) and the sintering step d) are performed simultaneously (paragraph 52)." However, the cited paragraph 52 of Enokido et al. says nothing about simultaneous sintering and heating to remove particles. Thus, contrary to the Examiner's assertion, Enokido et al. does not teach removal of particles by heating and simultaneously performing sintering as recited in Appellants' claim 5.

D. Claim 31

Claim 31 recites: "The method of claim 1 wherein the particles comprise substantially spherical particles." The Examiner has stated that "Enokido discloses the method of claim 1 wherein the particles comprise substantially spherical particles (FIG. 8, item **61**)." However, contrary to the Examiner's assertion, items **61** in FIG. 8 of Enokido et al. are not at all like the particles in the slurry of Appellants' claim 1; they are *drops of binder* **61** (Enokido, paragraphs 103 – 108). Thus, Enokido et al. does not teach the use of spherical particles in a slurry as recited in Appellants' claim 31.

E. Claim 36

Claim 36 recites: "The method of claim 1, wherein the photonic-crystal filament has a desired photonic band-gap, and the substantially uniform size of the particles is adapted to provide the desired photonic band-gap." Regarding claim 36 specifically, the Examiner has stated that "Enokido discloses the method of claim 1 wherein the photonic-crystal filament has a desired photonic band-gap, and the substantially uniform size of the particles is adapted to provide the desired photonic band-gap (paragraph 71). However, contrary to the Examiner's assertion, the cited paragraph of Enokido et al. does not mention substantially uniform particle size or any particle size, but only the spacing of neighboring pillars and the periodic cycle of aligning the pillars. When Enokido et al. does mention particle size (paragraphs 74 and 78), it is

only to recite preferred size ranges, not mentioning any uniformity requirement or any adaptive relationship to a desired photonic band-gap. Thus, Enokido et al. does not teach the subject matter of Appellants' claim 36.

F. Claim 40

Dependent claim 40 recites: "The method of claim 1, wherein the photonic-crystal filament has a longitudinal axis, and a selected crystallographic axis of the desired crystallographic configuration is aligned parallel to the longitudinal axis of the photonic-crystal filament." The Examiner has earlier stated that FIG. 8, item **61** of Enokido et al. teaches the limitations of claim 40. However, item **61** is merely a binder (paragraphs 103 – 108 of Enokido et al.); it is neither a photonic-crystal filament nor a desired crystallographic configuration. Thus, neither that figure nor the associated specification of Enokido et al. teaches the subject matter of Appellants' claim 40.

Thus, the teachings of Enokido et al. fail to disclose every limitation of the rejected claims, and the rejections under 35 USC § 102(e) of claims 1, 4, 5, 31, 36, and 40 should therefore be reversed.

III. The Examiner's Rejection of Claims 3, 8, 29 – 30, 32, 44 – 48, and 50 under 35 U.S.C. § 103(a) as Being Unpatentable over Enokido et al. (US 2004/0255841) Should be Reversed Because It Would Not Be Obvious to Modify Enokido et al. so as to Include Every Limitation of Each of the Claims.

In each of these rejections for obviousness, the Examiner has stated that Enokido et al. discloses the method of claim 1 and then has discussed the supposed obviousness of each dependent claim. The premise that Enokido et al. discloses the method of claim 1 is traversed hereinabove in the discussion of rejections under 35 U.S.C. § 102(e). In that discussion it has been shown that Enokido et al. fails to disclose every limitation of claim 1. Dependent claims 3, 8, 29, 30, and 32 inherit all the limitations of their parent independent claim 1. Therefore, for the same reasons stated above, Appellants respectfully request that these rejections of claims 3, 8, 29, 30, and 32 under 35 USC § 103(a) be reversed.

A. Claim 3

Claim 3 recites: "The method of claim 1, further comprising the step of:
e) compressing the slurry."

The Examiner correctly stated that Enokido does not expressly disclose the further step of e) compressing the slurry as claimed by Appellants and that "Enokido does disclose that a slurry is stirred and then fed through the print heads (paragraph 96)." However, the Examiner then further asserted that "for the slurry to fit through the print heads, it would have to be compressed or reduced." There is no basis for this conclusion by the Examiner anywhere in Enokido et al. nor in the material incorporated by reference from Sachs et al. There is nothing anywhere in the record to support this conclusion by the Examiner.

B. Claim 8

Claim 8 recites: "The method of claim 1, further comprising the step of:
g) reducing the precursor material to metallic form."

Regarding claim 8, the Examiner correctly stated that Enokido does not expressly disclose the further step of "g) reducing the precursor material to metallic form" as claimed by Appellants. The Examiner stated that "Enokido does disclose that the slurry is of metallic form (paragraph 39); hence it would have been obvious to one having ordinary skill in the art at the time the invention was made that the precursor material would be of metallic form, since the slurry is as well." However, contrary to the Examiner's assertion, Appellants have *not* claimed that the precursor material in the slurry would be of metallic form. Appellants' dependent claim 8 claims the *further* step of *reducing the precursor material* to metallic form. Such a reducing step is not disclosed or fairly suggested by Enokido et al.

C. Claims 29 and 30

The same reasoning applies to the rejections of claims 29 and 30, each of which, like claim 8, use a precursor material in dependent claims that depend upon claim 1, previously distinguished from Enokido et al. Claim 29 recites: "29. The method of claim 1, wherein the precursor material comprises an oxide of tungsten." Claim 30 recites: "30. The method of claim 1, wherein the

precursor material comprises peroxopolytungstic acid." With regard to both claims 29 and 30, the Examiner has stated that it would have been obvious to have the precursor material comprise the claimed substance, "since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the purpose of using it for the precursor material." However, there is no support or suggestion in Enokido et al. or in any of the prior art of record for the Examiner's assertion that tungsten oxide or peroxopolytungstic acid as claimed are suitable for Appellants' purpose in these claims.

D. Claim 32

Claim 32 recites: "The method of claim 1 wherein the particles comprise non-spherical particles."

Regarding claim 32, the Examiner has correctly stated that Enokido does not expressly disclose that the particles comprise non-spherical particles as claimed by Appellants, but the Examiner has then stated that it would have been obvious "to change the shape of the particle to be non-spherical, since such a modification would have involved a mere change in the shape of the particle" and a "change of shape is generally recognized as being with (sic) the level of ordinary skill in the art." Appellants respectfully submit that reliance upon such a *per se* rule to show obviousness is clearly erroneous.

E. Claim 44

Independent claim 44 as amended recites:

"44. A method of cladding a metal filament, the method comprising the steps of:

a) providing a metal filament;

b) mixing a slurry comprising particles of substantially uniform size and a precursor material for a desired metal;

c) urging the metal filament and the slurry through an orifice while forcing the particles and precursor material into a combination having a desired crystal configuration surrounding the metal filament;

d) drying the combination having the desired crystallographic configuration emerging from the orifice;

e) sintering the precursor material; and

f) compressing the precursor material within a sheath, while drawing the filament and sheath through a series of two or more successively smaller dies, whereby the filament is clad with a photonic crystal."

The Examiner has asserted that specific identified portions of Enokido et al. disclose each of the paragraphs a) – e) of Appellants' claim 44, but not paragraph f). We consider each of these assertions in turn. The Examiner stated that Enokido et al. discloses "a) providing a metal filament" (paragraph 39). However, contrary to the Examiner's assertion, paragraph 39 of Enokido et al. does not disclose a filament of any kind. Nor does the material of Sachs et al., incorporated by reference in paragraph 39 of Enokido et al.

The Examiner stated that Enokido et al. discloses Appellants' paragraph "b) mixing a slurry comprising particles of substantially uniform size and a precursor material for a desired metal" (paragraphs 40 – 49 and FIG. 7, items **41a**, **42a**, and **43a**). In FIG. 7, **41a** is a slurry tank, **42a** is unspecified, and **43a** is a stirrer (paragraphs 96 – 98). However, contrary to the Examiner's assertion, paragraphs 40 – 49 of Enokido et al. do not disclose a slurry including a precursor material for a desired metal. The dielectric powder dispersed in the slurry of Enokido et al. may or may not comprise particles of substantially uniform size; Enokido et al. does not disclose the uniformity of their size distribution, except to say that "particle size of the dielectric powders falls between 0.5 and 2.0 .mu.m or so" (paragraph 74) and "their particle size preferably falls between 0.1 and 5.0 .mu.m, more preferably between 0.5 and 2.0 .mu.m" (paragraph 78). These particle-size ranges are so wide that they would not indicate substantial uniformity of particle size to a person of ordinary skill in the art. Thus, the portion of Enokido et al. cited by the Examiner as disclosure of Appellants claim 44 paragraph b) does not disclose the claimed subject matter.

The Examiner stated that Enokido et al. discloses Appellants' paragraph "c) urging the metal filament and the slurry through an orifice while forcing the particles and precursor material into a combination having a desired crystal configuration surrounding the metal filament" (FIG. 7, item **46a** and paragraphs 41 – 49). However, contrary to the Examiner's assertion, Enokido et al. discloses no such thing. Neither Enokido et al. nor the material incorporated by reference discloses urging a metal filament and the slurry through an orifice while forcing the particles and precursor material into a combination having a desired crystal configuration surrounding a metal filament as claimed by Appellants. Paragraph 79 of Enokido et al. recites: "The heads **45a** to **45k** are equipped with nozzles **46a** to **46k**, respectively, via which fine drops **33** of each slurry or binder are jetted out onto the substrate **31**." There is no metal filament disclosed anywhere in Enokido et al. nor in the material incorporated by reference into Enokido et al.

The Examiner stated that Enokido et al. discloses Appellants' paragraph "d) drying the combination having the desired crystallographic configuration" (paragraph 47) "emerging from the orifice" (paragraphs 41 – 50). However, contrary to the Examiner's assertion, paragraph 47 of Enokido et al. discloses a step **S7** of curing a binder. The slurry-drying step **S3** of Enokido et al. (described in paragraph 41) removes solvent from a layer of dielectric that has *not yet been formed in a three-dimensional periodic structure of the photonic crystal.* Their three-dimensional periodic structure is not formed until step **S4** of binder printing (paragraphs 43 – 44 and FIG. 1) which occurs only after their slurry-drying step **S3**. Thus, again, the claimed subject matter of Appellants' claim 44 paragraph d) is not disclosed by Enokido et al.

The Examiner stated that Enokido et al. discloses Appellants' paragraph "e) sintering the precursor material" (paragraph 52). The cited paragraph discloses sintering of the shaped body disclosed by Enokido et al. As pointed out hereinabove, Enokido et al. does not disclose a slurry including a precursor material for a desired metal. Therefore, the shaped body sintered in paragraph 52 of Enokido et al. does not correspond to Appellants' "precursor material." Thus, Enokido et al. does not disclose Appellants' paragraph e).

The Examiner has correctly noted that Enokido et al. does not disclose compressing the precursor material within a sheath, while drawing the filament and sheath through a series of two or more successively smaller dies, whereby the filament is clad with a photonic crystal, as recited in Appellants' claim 44 paragraph f). However, the Examiner then cites the disclosure of Enokido et al. that a slurry is stirred in a "sheath" (i.e., Enokido's tank in the Examiner's interpretation) and "then fed though print heads such that the filament and photonic crystal are mixed (paragraph 96)". However, contrary to the Examiner's assertion, Enokido's tank is not a sheath surrounding a filament, and no filament and photonic crystal are mixed in Enokido's tank. Paragraph 96 of Enokido et al. clearly describes what is happening in their tanks **41a – 41k**: Slurries (prepared by dispersing a dielectric powder in a solvent and a binder) are stirred so that the dielectric powder does not deposit in the tanks. The slurries and the binder pooled in the tanks are fed to corresponding jet printheads **45a – 45k**. This bears no resemblance to the subject matter of Appellants' claim 44, paragraph f).

Appellants respectfully submit that it appears that for each feature of Appellants' claim 44, disparate elements disclosed by Enokido et al. have been selected and interpreted by the Examiner with the benefit of hindsight to attempt to fit those elements to the limitations of the claim. The Examiner has not presented a proper *prima facie* case of obviousness of claim 44.

F. Claim 45

Claim 45 recites: "The clad filament formed by the cladding method of claim 44." Regarding claim 45, the Examiner has stated that "to be entitled to weight in method claims, the recited structure limitations must affect the method in a manipulative sense, and not to amount to the mere claiming of a particular structure, such as the clad filament" (Final Office Action, page 6). However, claim 45 is a product-by-process claim, dependent upon method claim 44. All the manipulative steps necessary to form the structure are recited in the independent parent claim 44.

G. Claim 46

Claim 46 recites: "The method of claim 44, further comprising the step of: g) compressing the slurry."

Regarding claim 46, the Examiner has correctly stated that Enokido et al. does not expressly disclose the further step "g) compressing the slurry" as claimed by Appellants. The Examiner then asserted that Enokido discloses that the slurry is stirred and then fed through the print heads (paragraph 96) and "therefore, for the slurry to fit through the print heads, it would have to be compressed or reduced as claimed." However, Enokido et al. teach in paragraph 97 that the jet printheads may jet out the liquid drops "based on their thermal expansion caused by a heater equipped thereto." Such thermal expansion is clearly not the compression that the Examiner concluded would be required. As pointed out hereinabove in connection with claim 3, there is no basis for this conclusion by the Examiner anywhere in Enokido et al. nor in the material incorporated by reference from Sachs et al. There is nothing anywhere in the record to support this conclusion by the Examiner.

H. Claim 47

Claim 47 recites: "The method of claim 44, further comprising the step of: h) heating the dried combination to remove the particles."

Regarding claim 47, the Examiner has stated that Enokido discloses the method further comprising the step of "h) heating the dried combination to remove the particles" (paragraphs 41 – 49). However, contrary to the Examiner's assertion, Enokido et al. teaches removing unbound dielectric powder particles by dipping in water (referred to as re-dispersion) (paragraph 49), not by heating as recited in Appellants' claim. Thus, again, Enokido et al. does not disclose or fairly suggest the subject matter of Appellants' invention as claimed.

I. Claim 48

Claim 48 recites: "The method of claim 47, wherein the heating step h) and the sintering step e) are performed simultaneously." Regarding claim 48, the Examiner has stated that Enokido discloses the method of claim 48 (paragraph 52). However, contrary to the Examiner's assertion, paragraph 52 of

Enokido et al. recites in pertinent part (emphasis added): "*After the drying step* **S9**, the shaped body may be fired into a sintered body *in the next firing step* **10**." Thus, Enokido et al. clearly teaches *sequential* steps, not *simultaneous* performance of two steps. Thus, again Enokido et al. fails to teach or fairly suggest the claimed subject matter.

J. Claim 50

Claim 50 recites: "The method of claim 44, wherein the precursor material comprises a metal oxide." Regarding claim 50, the Examiner has correctly stated that Enokido does not disclose that a precursor material comprises a metal oxide as claimed by Appellants, but the Examiner has then stated that it would have been obvious "to have the precursor comprise a metal oxide" since "it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the purpose of using it for the precursor material." Appellants respectfully submit that reliance upon such a *per se* rule to show obviousness is clearly erroneous. There is no support or suggestion in Enokido et al. or in any of the prior art of record for the Examiner's assertion that a metal oxide as claimed is obviously suitable for Appellants' purpose in claim 50.

Thus, for each of the claims 3, 8, 29 – 30, 32, 44 – 48, and 50, the Examiner has not presented a proper *prima facie* case of obviousness, and it would not be obvious to modify Enokido et al. so as to include every limitation of each of the claims. Therefore, reversal of these rejections is respectfully requested.

IV. The Examiner's Rejection of Claims 6, 7, 26 – 28, 33 – 35, and 49 under 35 U.S.C. § 103(a) as Being Unpatentable Over Enokido et al. (US 2004/0255841) in View of Fleming et al. (US 6,7698,256) Should Be Reversed Because It Would Not Be Obvious to Modify Enokido et al. so as to Include Every Limitation of Each of the Claims.

Dependent claims 6 – 7, 26 – 28, and 33 – 35 depend upon claim 1. The Examiner's premise that Enokido et al. discloses the method of claim 1 is traversed hereinabove in the discussion of rejections under

35 U.S.C. § 102(e). In that discussion it has been shown that Enokido et al. fails to disclose every limitation of claim 1. Dependent claim 49 depends upon independent claim 44. The Examiner's premise that Enokido et al. discloses the method of claim 44 is traversed hereinabove in the discussion of other rejections under 35 U.S.C. § 103. In that discussion also, it has been shown that Enokido et al. fails to disclose every limitation of claim 44. Thus, for each of these claims 6, 7, 26 – 28, 33 – 35, and 49, no combination of the teachings of Enokido et al. with the teachings of Fleming et al. would include every limitation of each claim.

A. Claims 6, 33 – 35, and 49

Claims 6, 33 – 35, and 49 respectively recite:

"6. The method of claim 1, wherein the particles comprise an inert material.

33. The method of claim 1 wherein the particles comprise polymer particles.

34. The method of claim 1 wherein the particles comprise polymer nanospheres.

35. The method of claim 34, wherein the polymer particles comprise a material selected from the list consisting of polystyrene, polyethylene, polymethylmethacrylate (PMMA), latex, and combinations thereof.

49. The method of claim 44, wherein the particles comprise an inert material."

Regarding claims 6, 33, 34, 35, and 49 the Examiner correctly states that Enokido et al. does not disclose particles comprising an inert material (claims 6 and 49) or a polymer (claim 33) or polymer nanospheres (claim 34) or polymer particles selected from a claimed Markush list (claim 35). Regarding claim 6 and 49, the Examiner states: "Fleming is cited to show a photonic crystal with particles comprising silicone, an inert material (col. 5, lines 53 – 56)." Regarding claim 33, the Examiner states: "Fleming is cited to show a photonic crystal with particles comprising silicone, a polymer (col. 5, lines 53 – 56)." However, Fleming et al. does not disclose the use of inert silicone particles or a silicone

polymer or polymer particles. The material disclosed by Fleming et al. (col. 5, lines 53 – 56) is not silicone, but the element silicon, which is disclosed in Fleming et al. not as inert particles or as a polymer, but as a complete photonic crystal structure. Any suggestion by Fleming et al. to modify spectral properties (postulated by the Examiner based upon Fleming col. 2, lines 32 – 33) is not pertinent to these claims, whose limitations specifically employ an inert material and a polymer respectively. Silicon is not an inert material; it reacts chemically with many other substances, including oxygen and nitrogen. Those skilled in the art would also recognize that elemental silicon is also not a polymer. Thus, Fleming et al. does not suggest the use of particles comprising an inert material or a polymer as asserted by the Examiner. Therefore, Appellants respectfully submit that the Examiner has not presented a proper *prima facie* case for obviousness of any of the claims 6, 33 – 35, or 49. None of these claims would not have been obvious to a person of ordinary skill.

B. Claim 7

Claim 7 recites: "The method of claim 1, wherein the precursor material comprises a metal oxide." Regarding claim 7, the Examiner correctly states that Enokido et al. does not disclose a precursor material comprising a metal oxide. To provide the metal oxide missing from the disclosure of Enokido et al., the Examiner cites the use of tungsten by Fleming et al. (col. 6, lines 15 – 18). The material disclosed by Fleming et al. is tungsten (an elemental metal, not a metal oxide). Therefore, again, Appellants respectfully submit that the Examiner has not presented a proper *prima facie* case for obviousness of claim 7 and that this claim would not have been obvious to a person of ordinary skill.

C. Claims 26 – 28

Claims 26 – 28 respectively recite:

"26. The method of claim 1, wherein the desired metal is a refractory metal.

27. The method of claim 26, wherein the refractory metal is selected from the list consisting of tungsten, platinum, tantalum, molybdenum, and alloys thereof.

28. The method of claim 1, wherein the desired metal is tungsten or an alloy thereof."

Regarding claims 26 and 27, the Examiner correctly states that Enokido et al. does not disclose a precursor material comprising a refractory metal. Fleming et al. (col. 6, lines 15-18) does disclose a refractory metal (tungsten). However, no combination of Enokido et al. and Fleming et al. would make the invention of claim 26, including all the limitations of claim 1 as amended. In particular, neither Enokido et al. nor Fleming et al. nor any of the prior art of record discloses forcing the particles into a combination having a desired crystallographic configuration while urging a slurry through an orifice. Therefore, neither claim 26 nor claim 27 would have been obvious in view of any combination of Enokido et al. with Fleming et al. The same argument applies to claim 28, which recites tungsten or an alloy thereof.

Thus, as shown hereinabove, no combination of the teachings of Enokido et al. with the teachings of Fleming et al. would include every limitation of any of claims 6 – 7, 26 – 28, 33 – 35, and 49. For all of these reasons, Appellants respectfully request that the rejections under 35 U.S.C. § 103(a) of claims 6 – 7, 26 – 28, 33 – 35, and 49 be reversed.

V. The Examiner's Rejection of Claims 9 and 10 under 35 U.S.C. § 103(a) as Being Unpatentable Over Enokido et al. (US 2004/0255841) In View of Kodas et al. (US 2003/0175411) Should Be Reversed Because It Would Not Be Obvious to Modify Enokido et al. so as to Include Every Limitation of Each of the Claims.

Claims 9 and 10 respectively recite:

"9. The method of claim 8, wherein step g) of reducing the precursor material comprises heating the precursor material in a reducing environment.

10. The method of claim 9, wherein the reducing environment comprises a gas selected from the list consisting of hydrogen, forming gas, a carbide gas, acetylene, and mixtures thereof."

Dependent claims 9 and 10 depend upon claim 1. The Examiner's premise that Enokido et al. discloses the method of claim 1 is traversed hereinabove in the discussion of rejections under 35 USC § 102(e). In that discussion, it has been shown that Enokido et al. fails to disclose every limitation of claim 1. Thus, for each of claims 9 and 10, no combination of the teachings of Enokido et al. with the teachings of Fleming et al. would include every limitation of the claim.

The Examiner has correctly stated that Enokido et al. does not disclose that heating of a precursor material is done in a reducing environment as claimed by Appellants. Kodas is cited to show a precursor composition that is heated under a reducing environment (paragraph 495) and that certain reaction conditions help the formation of the metal at a desired temperature (paragraph 133).

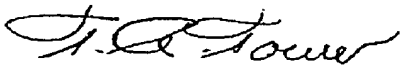
However, neither Enokido et al. nor Kodas et al. nor any of the prior art of record discloses urging their slurry through an orifice *while forcing the particles into a combination having a desired crystallographic configuration*. As pointed out hereinabove, the three-dimensional periodic structure of the photonic crystal of Enokido et al. is not formed by their steps **S2** of slurry deposition and **S3** of slurry drying, but is formed later in step **S4** of binder printing (paragraphs 43 – 44 and FIG. 1). Their step **S4** occurs after their slurry-drying step **S3** (FIG. 1). Thus, neither claim 9 nor claim 10 would have been obvious in view of any combination of Enokido et al. with Kodas et al. Therefore, Appellants respectfully request that the rejections under 35 USC § 103(a) of claims 9 and 10 be reversed.

SUMMARY AND CONCLUSION

In view of the foregoing, the Appellants submit that claims 1, 4 – 5, 31, 36, and 40 are not properly rejected under 35 U.S.C. § 102(e) as being anticipated by Enokido et al. (US 2004/0255841) and are therefore patentable; that claims 3, 8, 29 – 30, 32, 44 – 48, and 50 are not properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Enokido et al. and are therefore patentable; claims 6 – 7, 26 – 28, 33 – 35, and 49 under 35 U.S.C. § 103(a) are not properly rejected as being unpatentable over Enokido et al. in view of Fleming et al. (US 6,768,256) and are therefore patentable; and claims 9 and 10 are not properly rejected under 35 U.S.C. § 103(a) as being unpatentable over Enokido et al. in view of Kodas et al. (US 2003/0175411) and are therefore patentable. Accordingly, Appellants respectfully request that the Board reverse all claim rejections and indicate that a Notice of Allowance respecting all pending claims should be issued.

Dated this 1st day of March, 2007.

Respectfully submitted,



Theodore R. Touw
Reg. No. 36,702
Attorney/Agent for Appellants
Telephone: (541) 967-9133
Facsimile: (541) 967-9134

Please address written communications to:

HEWLETT-PACKARD COMPANY
Intellectual Property Administration
P.O. Box 272400
Fort Collins, Colorado 80527-2400

CLAIMS APPENDIX

1. (Previously presented) A method for forming a photonic-crystal filament, the method comprising the steps of:

a) mixing a slurry comprising particles of substantially uniform size and a precursor material for a desired metal;

b) urging the slurry through an orifice while forcing the particles and precursor material into a combination having a desired crystallographic configuration;

c) drying the combination having a desired crystallographic configuration emerging from the orifice; and

d) sintering the precursor material, whereby a photonic-crystal filament is formed.

2. (Withdrawn) A photonic-crystal filament made by the method of claim 1.

3. (Original) The method of claim 1, further comprising the step of:

e) compressing the slurry.

4. (Original) The method of claim 1, further comprising the step of:

f) heating the dried combination to remove the particles.

5. (Original) The method of claim 4, wherein the heating step f) and the sintering step d) are performed simultaneously.

6. (Original) The method of claim 1, wherein the particles comprise an inert material.

7. (Original) The method of claim 1, wherein the precursor material comprises a metal oxide.

8. (Original) The method of claim 1, further comprising the step of:

g) reducing the precursor material to metallic form.

9. (Original) The method of claim 8, wherein step g) of reducing the precursor material comprises heating the precursor material in a reducing environment.

10. (Original) The method of claim 9, wherein the reducing environment comprises a gas selected from the list consisting of hydrogen, forming gas, a carbide gas, acetylene, and mixtures thereof.

11. (Withdrawn) The method of claim 1, further comprising the step of:

h) providing a core filament and feeding the core filament through the orifice while urging the slurry through the orifice to force the particles and precursor material into a combination surrounding the core filament.

12. (Withdrawn) The method of claim 11, further comprising the step of:

i) passing an electric current through the core filament, whereby the core filament is heated.

13. (Withdrawn) The method of claim 12, wherein the electric current heats the precursor material to an effective temperature for sintering the precursor material.

14. (Withdrawn) The method of claim 11, further comprising the step of:

j) removing the core filament after the precursor material is sintered.

15. (Withdrawn) The method of claim 1, further comprising the step of:

k) compressing the precursor material within a sheath.

16. (Withdrawn) The method of claim 15, wherein the sheath comprises a metal.

17. (Withdrawn) The method of claim 16, wherein the metal of the sheath comprises copper.

18. (Withdrawn) The method of claim 15, wherein step k) of compressing the precursor material is performed by drawing the sheath through at least one die.

19. (Withdrawn) The method of claim 18, wherein step k) of compressing the precursor material is performed by drawing the sheath through a series of two or more successively smaller dies.

20. (Withdrawn) The method of claim 15, wherein the sheath comprises a gas-permeable material.

21. (Withdrawn) The method of claim 15, further comprising the step of:
l) removing the sheath after the precursor material is sintered.

22. (Withdrawn) The method of claim 15, further comprising the step of:
m) providing a core filament and feeding the core filament through the orifice while urging the slurry through the orifice to force the particles and precursor material into a combination surrounding the core filament and while compressing the precursor material within the sheath.

23. (Withdrawn) The method of claim 22, further comprising the step of:
n) removing the sheath after the precursor material is sintered.

24. (Withdrawn) The method of claim 22, further comprising the step of:
o) removing both the sheath and the core filament after the precursor material is sintered.

25. (Withdrawn) A photonic-crystal filament made by the method of claim 15.

26. (Original) The method of claim 1, wherein the desired metal is a refractory metal.

27. (Previously presented) The method of claim 26, wherein the refractory metal is selected from the list consisting of tungsten, platinum, tantalum, molybdenum, and alloys thereof.

28. (Original) The method of claim 1, wherein the desired metal is tungsten or an alloy thereof.

29. (Original) The method of claim 1, wherein the precursor material comprises an oxide of tungsten.

30. (Original) The method of claim 1, wherein the precursor material comprises peroxopolytungstic acid.

31. (Original) The method of claim 1 wherein the particles comprise substantially spherical particles.

32. (Original) The method of claim 1 wherein the particles comprise non-spherical particles.

33. (Original) The method of claim 1 wherein the particles comprise polymer particles.

34. (Original) The method of claim 1 wherein the particles comprise polymer nanospheres.

35. (Original) The method of claim 34, wherein the polymer particles comprise a material selected from the list consisting of polystyrene, polyethylene, polymethylmethacrylate (PMMA), latex, and combinations thereof.

36. (Original) The method of claim 1, wherein the photonic-crystal filament has a desired photonic band-gap, and the substantially uniform size of the particles is adapted to provide the desired photonic band-gap.

37. (Withdrawn) The method of claim 36, wherein the desired photonic band-gap has a lower wavelength edge and the substantially uniform size of the particles is chosen to be about one-quarter the value of the lower wavelength edge of the desired photonic band-gap.

38. (Withdrawn) The method of claim 36, wherein the desired photonic band-gap corresponds to a wavelength between about 400 nanometers and about 7000 nanometers.

39. (Withdrawn) The method of claim 36, wherein the desired photonic band-gap corresponds to a wavelength between about 1200 nanometers and about 1800 nanometers.

40. (Original) The method of claim 1, wherein the photonic-crystal filament has a longitudinal axis and a selected crystallographic axis of the desired crystallographic configuration is aligned parallel to the longitudinal axis of the photonic-crystal filament.

41. (Withdrawn) A lamp filament made by the method of claim 1.

42. (Withdrawn) An incandescent lamp comprising a photonic-crystal filament made by the method of claim 1.

43. (Withdrawn) A light source comprising the incandescent lamp of claim 43.

44. (Previously presented) A method of cladding a metal filament, the method comprising the steps of:

a) providing a metal filament;

b) mixing a slurry comprising particles of substantially uniform size and a precursor material for a desired metal;

c) urging the metal filament and the slurry through an orifice while forcing the particles and precursor material into a combination having a desired crystal configuration surrounding the metal filament;

d) drying the combination having the desired crystallographic configuration emerging from the orifice;

e) sintering the precursor material; and

f) compressing the precursor material within a sheath, while drawing the filament and sheath through a series of two or more successively smaller dies, whereby the filament is clad with a photonic crystal.

45. (Previously presented) The clad filament formed by the cladding method of claim 44.

46. (Previously presented) The method of claim 44, further comprising the step of:

g) compressing the slurry.

47. (Previously presented) The method of claim 44, further comprising the step of:

h) heating the dried combination to remove the particles.

48. (Previously presented) The method of claim 47, wherein the heating step h) and the sintering step e) are performed simultaneously.

49. (Previously presented) The method of claim 44, wherein the particles comprise an inert material.

50. (Previously presented) The method of claim 44, wherein the precursor material comprises a metal oxide.

51. (Withdrawn) A photonic crystal for covering a filament core, the photonic crystal comprising:

a first refractory metal substantially filling interstitial spaces between a set of substantially spherical voids disposed in a predetermined crystallographic lattice,

the set of spherical voids being disposed surrounding the filament core.

52. (Withdrawn) The photonic crystal of claim 51, wherein the filament core comprises a second refractory metal.

53. (Withdrawn) The photonic crystal of claim 52, wherein the first and second refractory metals comprise different metals.

54. (Withdrawn) The photonic crystal of claim 52, wherein the first and second refractory metals comprise the same metal.

55. (Withdrawn) The photonic crystal of claim 52, wherein the first and second refractory metals both comprise tungsten or an alloy thereof.

56. (Withdrawn) The photonic crystal of claim 51, further comprising a filling material disposed within the spherical voids, the filling material differing in refractive index from the first refractory metal.

57. (Withdrawn) The photonic crystal of claim 56, wherein the filling material substantially fills the spherical voids.

58. (Withdrawn) The photonic crystal of claim 51, wherein the filament core has a longitudinal axis and a selected crystallographic axis of the predetermined crystallographic lattice is aligned parallel to the longitudinal axis of the filament core.

59. (Withdrawn) The photonic crystal of claim 51, wherein the first refractory metal comprises tungsten or an alloy thereof.

60. (Withdrawn) A method of using a photonic crystal to reduce emission of selected wavelengths of radiation from a filament, the method comprising the steps of:

a) providing a core filament and an electrical input connected to the core filament; and

b) cladding the core filament with a photonic crystal material which is operable to reduce emission of selected wavelengths of radiation during the resistance heating of the filament when electrical energy is conducted to the input and to the core filament.

61. (Withdrawn) The method of claim 60, wherein the core filament has a longitudinal axis and the photonic crystal material has crystallographic axes, the method further comprising the step of aligning a selected one of the crystallographic axes of the photonic crystal material parallel to the longitudinal axis of the core filament.

62. (Withdrawn) A method for filtering light from a light source having a longitudinal axis, comprising the steps of:

a) providing a photonic crystal having a predetermined crystallographic axis and a photonic band-gap adapted to block selected wavelengths of light; and

b) surrounding the light source with the photonic crystal while aligning the predetermined crystallographic axis parallel to the longitudinal axis of the light source.

63. (Withdrawn) A filament comprising, in combination:

a) elongated filamentary means for emitting radiation in a range of wavelengths in response to resistance heating; and

b) means for filtering, surrounding the filamentary means for emitting radiation, the filtering means comprising a photonic crystal, the photonic crystal being disposed surrounding the filamentary means for emitting radiation, and the photonic crystal having a band-gap adapted to reduce the emission of selected wavelengths at least partially within the range of wavelengths.

64. (Withdrawn) An electrical device comprising:

a) a support,

b) a transparent envelope secured to the support and forming an enclosure therewith,

c) a filament having a metal core portion, and

d) an input for electrical energy secured to the support and electrically coupled to the filament, the metal core portion of the filament being coated with a photonic crystal material which is effective in reducing emission of selected wavelengths of radiation during the resistance heating of the filament when electrical energy is conducted to the input and to the metal core portion of the filament.

65. (Withdrawn) The electrical device of claim 64, wherein the selected wavelengths of radiation are selected infrared wavelengths and the photonic crystal material has a photonic band-gap corresponding to the selected infrared wavelengths.

66. (Withdrawn) The electrical device of claim 64, wherein the metal core portion of the filament has a longitudinal axis, the photonic crystal material has crystallographic axes, and a selected one of the crystallographic axes of the photonic crystal material is aligned substantially parallel to the longitudinal axis of the metal core portion of the filament.

EVIDENCE APPENDIX

There is no evidence previously submitted under 37 C.F.R. §§ 1.130, 1.131 or 1.132 or other evidence entered by the Examiner and relied upon by Appellant in this appeal. Accordingly, the requirements of 37 C.F.R. §§ 41.37(c)(1)(ix) are satisfied.

RELATED PROCEEDINGS APPENDIX

There are no decisions rendered by a Court or the Board in a proceeding identified in the Related Appeals and Interferences section. Accordingly, the requirements of 37 C.F.R. §§ 41.37(c)(1)(x) are satisfied.